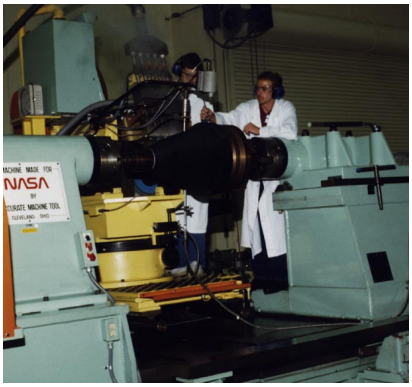
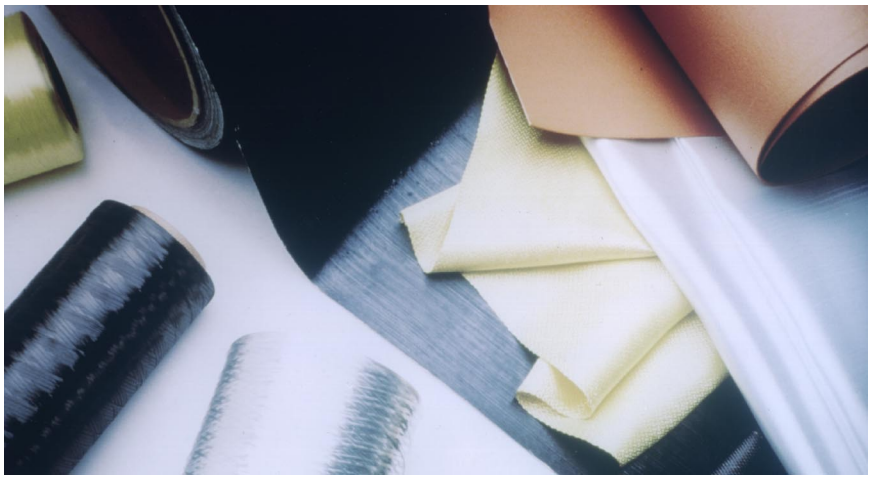
Technology Opportunity

Composite Materials Manufacturing at Marshall Space Flight Center



NASA-developed technology to produce stronger, lighter-weight composite materials is available to U.S. industries through the Technology Transfer Office at Marshall Space Flight Center (MSFC) in Huntsville, Alabama. Although scientists and engineers at MSFC are working to develop better composite materials for use in the Reusable Launch Vehicle (RLV) program, the resulting technology has many other possible applications.

In MSFC's Productivity Enhancement Complex, automated composite fabrication systems can work precisely with many different types of materials, including glass, Kevlar, and carbon/graphite fibers. Engineers are involved in solid rocket motor case and nozzle technology; the development of advanced techniques for aerospace structures; thick composite structures; forming prototype parts for solid rocket boosters, external tank fairings, and space station equipment racks and pressure bottles.



Potential Commercial Uses

Composite materials are already being used to increase the strength of a product without increasing the overall weight. Many sporting goods manufacturers are taking advantage of lighter, stronger, more durable composite materials in the production of such items as tennis rackets, fishing rods, skis, boat hulls, and golf club shafts. This technology can also be applied to the commercial transportation industry.

Benefits

Strength: Carbon/graphite fibers, combined with resins, create stronger, lighter-weight materials.

Durability: When weight is not a major concern, Kevlar can be used in the place of carbon/graphite fibers to produce a durable composite material.

Economical: In situations where the material's strength and weight are not important, fiberglass is the most economical composite material to use.

Pub 5-537-2(03)

National Aeronautics and Space Administration

George C. Marshall Space Flight Center

The Technology

Marshall's engineers use specialized machines and computer-aided drawings to produce high-strength, high-durability, low-cost composites.

The Filament Winding machine lays down ribbons of resin/fiber composite, building the material up layer-by-layer until the desired thickness and degree of strength have been reached. This four-axis vertical machine can produce both helical and polar patterns, with spherical parts up to two meters in diameter. Pressure vessels and similar symmetrically shaped items can be made with this machine.

A Pultrusion machine pulls resin through the die to shape it, creating long, continuous geometry tubes. This versatile machine can use carbon/graphite, Kevlar, or fiberglass, depending on the physical properties required of the finished composite item. This machine allows for rapid and economical manufacturing of parts.

The Tape Laying Machine in the Productivity Enhancement Complex has ten axes and three sensory systems. This three-dimensional automated tape laying machine will lay tape on flat or contoured surfaces with far greater control and precision than manual methods.

Marshall's Fiber Placement Machine is the first of its kind ever built. This machine was originally designed by MSFC and Cincinnati Milacron Corporation to make inlet ducts for the XF–22 jet fighter prototypes. Resin/fiber tapes can be deposited in patterns that can be narrowed or expanded, creating complex, geometrically shaped composite parts. Uses for this very sophisticated, computer-controlled robotic system are only beginning to be examined.

The Tape Wrapping machine at MSFC was designed to build solid rocket motor nozzles for the Space Shuttle. This machine has been adapted to produce nozzles that burn solid propellant/liquid oxidizer (hybrid) fuels and liquid fuels.

Technology Transfer

More information about MSFC's Composite Material Manufacturing capabilities is available through Marshall's Technology Transfer Office. Representatives from this office can help you determine how this technology can be used to help your company grow and prosper in today's competitive marketplace.

Contacts

Technology Transfer Office
Mail Code LA01
NASA/MSFC
Marshall Space Flight Center, AL 35812

Additional information about NASA's Technology Transfer Program and a Technology Transfer Agreement are available on the World-Wide Web:

(http://tectran.msfc.nasa.gov)

Key Words

Composite Materials
Materials Processing
Technology Transfer